A CONTRIBUTION TO THE DIAGNOSIS OF RENAL TUBERCULOSIS.

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MUCH interest of recent years has centered in the question of renal tuberculosis. In 1906 it occupied the German Surgical Congress in Berlin, while scarcely a surgeon of genito-urinary note, nor a pathologist, but has expressed himself with reference to the mode of incidence and extension of tuberculosis in the genito-urinary tract. Are we to regard this infection as originating in the kidneys and descending, or as occurring first in the lower part of the tract and ascending to the kidneys? Is it then but a secondary expression of tuberculosis elsewhere, or may it be a primary disease? Can then a nephrectomy offer a reasonable chance of cure or must we be content with internal medication and treatment and look upon such patients as beyond our help? And finally what should be the surgeon's position with regard to tuberculosis of the bladder?

While the position of the surgeon must be that of awaiting more definite proof our present knowledge, in our opinion, demands that he recognize:

First, that tuberculosis of the kidney is a blood infection, rather than an ascending infection from the bladder, etc.

Second, that it may be and often is a primary rather than a secondary manifestation and may affect one kidney, while the other long remains free.

Third, that the only promising treatment is excision.

Fourth, hence early diagnosis is of prime importance.

Fifth, that the cystoscope and ureteral catheter offer us the strongest support, not only in the diagnosis but also in the prognosis, by giving us information as to the physiological or pathological condition of the sister organ and of the bladder, information indeed as to the very presence of the former.

Tuberculosis of the genito-urinary tract was first described early in the last century and was then regarded as an entity; it was not until 1863 that Schmidtlein demonstrated that there was a urinary variety (affecting kidney, ureter and bladder) as well as a genital variety, and later Steinthal showed the importance of "primary" urinary or renal tuberculosis.

From a study of the following cases we were forced to conclude, in so far as so small a number will admit of a conclusion, that a focus in the kidney was the commonest origin of genito-urinary tuberculosis and one is not surprised on searching for further evidence on this point to find the unanimity of opinion in this respect. Among continental surgeons Caspar, Kummel, Zuckerkandl, Korteweg, Rovsing, Halle and Motz, Israel, Tuffier, Vigneron, Fenwick in England, Vandervccr and Walker, and others, in America, Ribbert and Adami, among other pathologists, speak for a blood infection of the kidney and a descending infection of the genito-urinary tract. Added to this are the now classic experiments of Baumgarten, later confirmed by Giani, who endeavored by first infecting the bladder, to obtain an ascending infection to the kidneys but without success. While Pels Lenden, by infecting the kidneys equally failed to cause a descending infection of ureter and bladder, Baumgarten, Durand, Fordel, Hauser were able to produce disease of the kidney by infecting it by means of intravenous injections. The late Professor Schede states that it is the general opinion that an ascending infection is also possible, though proof of this is lacking. Where we might have for example a tubercular epididymitis of some standing and a recent tuberculosis of the kidney, affecting chiefly the points of the pyramids, this view might receive support. So far in our experience, however, the incidence of the lesion associated with the renal disease has always occurred after the symptoms of involvement of the kidney have declared themselves.

To prove that a primary hæmatogenous infection of the kidney exists is easier than to prove it the rule. The case described as Case I, which subsequently came to autopsy, supports the former while as far as clinical facts can be relied upon the remaining cases, with the exception of Case III, support the latter. Here perhaps we should define what we mean by "primary." We have used it in the same sense as we speak of a primary tuberculosis in the lung. .This may be a direct infection from the air but the opinion of many pathologists—Ribbert, Adami, Orth, Councilman, Calmette and others—leans more and more to an infection entering through some portal of the digestive tract and thence by lymph stream and blood directly or by first infecting some lymph gland and so indirectly infecting lung or kidney or other organ as the case may be. It is in this sense of an infection, possibly from some unrecognizable source, that we apply the term.

In Case I, the patient after a long illness with early signs of kidney involvement, and at a later date some affection of the epididymis, underwent a nephrectomy and castration. Several months later he died of acute miliary tuberculosis. The autopsy showed all organs equally affected with the miliary type of the disease, but there was no old lesion which could be regarded as the source, either of the present miliary condition or of the former kidney lesion. In other words a primary unilateral tuberculosis had existed.

Such a condition of affairs where one kidney alone is diseased is not one to last for long, sooner or later we must expect either that other organs become affected or a general miliary tuberculosis, and an end similar to that just quoted. Naturally we should expect the pelvis and ureter to be first affected but true tuberculosis of the ureter seems far less common than a sclerosing secondary inflammation. The bladder is early affected (45 per cent.—Israel), while the prostate, seminal vesicles and epididymes may be later attacked. All of which facts urge us to the earliest possible diagnosis and removal of the infected lesion. And in these questions also, with the partial exception of Israel and Kuster who advise (the former) a trial by medication and (the latter) a partial excision, one finds the same unanimity of opinion that the question of primary renal tuberculosis evoked. What, however, has brought about this unanimity of opinion as to the earliest focus in the genito-urinary tract? Early diagnosis. Formerly we had to rely on post-mortem examinations, where the disease had frequently progressed far enough to have caused the patient's death. Of late we have many surgical cases, diagnosed early, which have shown us that the kidney was principally, or even alone involved; not only so but renal disease is at least frequently unilateral. Vigneron quotes 250 autopsies of renal tuberculosis, 123 of which were one-sided; while of 100 surgical cases but 17 were bilateral. Tuffier of 205 surgical cases found 99 unilateral, and Israel quotes 21 cases, 16 of which he considers primary and unilateral.

The early diagnosis of tuberculosis of the kidney is not easy. Just as is the case with tuberculosis elsewhere the phthisical history, the failing health, the possible evening rise of temperature, point in the right direction and taken in conjunction with local manifestations, such as the occurrence of pus and blood in the urine and symptoms of bladder involvement and enlargement of the kidney, would doubtless lead to a correct conclusion, even without the detection of the tubercle bacilli. It is not, however, in such cases that we can do the most good, but where we can detect the disease before enlargement of the kidney and marked involvement of the bladder has occurred. We say marked, for a moderate involvement of the bladder is not the contraindication we perhaps once thought it. The occurrence of pus or blood in the urine must always raise this possibility before us, but cases exist still more difficult where possibly no symptoms but a pyloria may be present. In all these cases the cystoscope and its accessories may render us valuable aid. Simple cystoscopic examination of the bladder is, as Fenwick has long shown, often invaluable. A close inspection of the ureteral orifices determining the presence of œdema—the "bullous œdema" of Caspar, about the opening, the occurrence of tubercles, later ulceration, and still later displacement of the orifice due to contraction of the ureter secondary to a sclerosing inflammation, are the points of chief interest and may suffice to lead us to a correct conclusion.

Nevertheless where one has gone so far he is scarcely justified not to go further and complete the clinical picture by catheterization of the ureters, difficult as this may be in these cases. The ureteral catheter is not a magic wand, but by it we can glean certain information often of the greatest importance. It furnishes the one certain method of collecting the separate urines and delivering them free from bladder contamination. It gives at the same time information as to the patency of the ureter and frequently as to its dilatation. Naturally we must rely chiefly on a careful examination of the urines so delivered and no means which may give us information in this respect can be neglected. Where possible cryoscopy and the estimation of sugar after the injection of phlorizin should be carried out, but we can support Rovsing who lays chief stress on the specific gravity, the urea determination and proper microscopical examination. It is in short the ureteral catheter rather than the so-called functional diagnosis which has led to the present improvement in renal operative statistics. Of course in some cases the most cursory examination of the urine so obtained suffices; the presence of pus from one kidney, possibly with tubercle bacilli, sets our minds at rest as to the site of the lesion, yet in all instances we should insist on examination of both sides, bilateral catheterization, as only on a comparison of one side with the other can we determine the functional ability of the sister kidney and in many instances it is on this comparison our diagnosis of disease must be made.

Following the hypothesis advanced and elaborated by Caspar that in health both kidneys secrete a urine similar in all particulars, a theory which a large number of cases examined by him amply justifies, and to the correctness of which our own cases lend evidence, and depending on the additional fact that a diseased kidney has its functioning power impaired, a fact also borne out by those accustomed to compare the work of one kidney with its fellow, we are enabled from the difference in the urinary secretion to draw certain conclusions as to the state of the kidney. Let me illustrate a case of, for instance, movable kidney, where, other diagnoses being possible an examination by catheterization of the ureters was made with the following result:

	COMMON	RIGHT	LEFT
Reaction:	Acid	Acid	Acid
Specific Gravity:	1010	1011	1011
Urea:	.8 per cent.	.8 per cent.	.8 per cent.
Albumin:	0	0	Trace
Microscopical:	Epithelium	Epithelium	Epithelium

Or a case of nephritis:

	COMMON	RIGHT	LEFT
Color:	Clear	Clear	Clear
Reaction:	Acid	Acid	Acid
Specific Gravity:	—	1037	1037
Albumin:	Trace	Trace	Trace
Urea:	—	2 per cent.	1.8 per cent.
Δ	—	—1.8	—1.9
Sugar: (Phlorizin)	—	1.25	1.0
Microscopical:	Hyaline casts		

We are enabled to say in the first instance that the kidneys are normal, and in the second a bilateral lesion of equal severity exists.

The actual values for specific gravity, urea, etc., may scarcely be within normal limits, due perhaps to a patient taking a quantity of fluid immediately before examination. Where however disease exists, as we hope to demonstrate by the following cases, the relation of one side to the other is upset. Even so we are unable to state that the sister organ is absolutely free from disease, but we can state as a result of our examination into its function that it is doing the larger share or it may be the whole of the necessary secretion and presents no sign of disease. It is therefore probably healthy. It has thus been our custom in those cases referred to us to endeavor to reach a correct conclusion by means of the cystoscope and ureteral catheter.

CASE I.—L., aged 38—Dr. G. E. Armstrong—a farmer, complained on February 23, 1906, of pain in the back and the end of the penis, more especially on micturition and exertion, also of pain and swelling of the left testicle and loss of 30 pounds in weight. The history of his illness began 3 years previously. While working at some heavy labor he was seized with an urgent desire to micturate and experienced some pain in the back. He passed a small amount of blood. The hæmaturia lasted one month, after which he recovered and was "as well as ever" for a further eight months (spring, 1904), when after exposure in cold water the symptoms returned and lasted one and one-half months. He then remained fairly well till March, 1905, when again subsequent to heavy manual labor the bleeding returned to be followed during the summer by some swelling of the left testicle and some cloudiness of his urine. The pain in the back became worse and for some six weeks previous to admission (Feb., 1906) to the Montreal General Hospital, he had been confined to bed.

Such a history pointed to a tubercular condition of the genito-urinary tract but where the lesion was situated and just what hope might be held out to the patient was far from certain. Physical examination showed a pulse rate of 84–104; temperature 99°–100° F.; a swollen nodular left epididymis; some tenderness of both epididymes and of the left seminal vesicle. The urine examination showed the specimen to be acid, specific gravity 1018, a trace of albumin, granular and hyaline casts, and pus in considerable quantity. The kidneys were not palpable. The lungs showed no sign of disease.

A cystoscopic examination showed a slough the size of a finger nail lying in the base of the bladder and a small ulcer about 5 mm. in diameter about the left ureter. The urine from this side was turbid. The ureters were catheterized with the following results:

Right: Clear, mucoid sediment, specific gravity 1009, yellow, albumin (?), urea 1.6 per cent. (blood discs, epithelium), no bacilli.

Left: Turbid purulent sediment, specific gravity 1004, pale, albumin present (large quantity), urea ½ per cent., blood, pus and tubercle bacilli.

Thus we were enabled to make a diagnosis of tuberculosis of the left kidney with slight involvement of the bladder and involvement of the left epididymis. Although the lapse of time since the first appearance of symptoms did not lead us to hope for any brilliant result, yet as the right kidney was in good condition and the left almost functionless a nephrectomy was performed. A large kidney with well marked tuberculosis of the pelvis and kidney tissue and ureter was removed with but slight alteration in the amount of urine passed in the 24 hours, confirming the belief that the damaged kidney was doing but little work. Subsequently the testis was removed.

The patient recovered fully from the operation but died during the following summer from miliary tuberculosis. The autopsy showed the sister kidney free from any old standing disease, indeed no other old focus was to be found, confirming our opinion that the primary lesion had been in the left kidney. It is interesting to note here the hæmaturia as an initial symptom and the length of time which the disease apparently remained confined to one kidney.

Case II.—M. B., female aged 29—Dr. J. M. Elder, December 18, 1905—recently emigrated from England, a cotton mill worker, had suffered from pain in the back for six or seven weeks. At first this was dull and trivial but later grew so severe as to cause her to give up her work and seek relief. She had lost some weight but gave no urinary history. On examination she proved to be a poorly nourished woman with a temperature range of 99°-100° and pulse rate as high as 140. Tenderness was present on the right side below the costal margin with dulness to percussion continuous with that of the liver. A mass could be felt in this position. The urine was acid, with a specific gravity of 1015, albumin was present and pus. The condition looked like an ordinary slight pyonephrosis.

The cystoscope showed a well marked cystitis, not tubercular in character, and about the right ureter a small ulcer the size of the head of a lead pencil. From the bottom of this a stream of pus spirts two or three times a minute, not unlike the smoke from the crater of a volcano. Compression of the abdominal mass between the hands causes the stream to increase. The urines were separated by catheters with the following result, 1 c.c. of phlorizin being injected hypodermically one half hour before the examination in order to cause glycosuria.

Right: Acid, specific gravity 1015, albumin present, sugar 0, urea 1.6 per cent., pus in considerable quantity, no tubercle bacilli, many cocci.

Left: Acid, specific gravity —, albumin a trace, sugar present, urea 1.8 per cent., no pus or bacilli.

From this we concluded that the left kidney was healthy, indeed all the phlorizin was secreted by the left although the urea determination showed but slight difference (probably an error) and the right side still had a high specific gravity, due in part however to the large quantity of pus present. From the ulcer about the ureteral orifice we felt that the question of tuberculosis could not be dismissed although no bacilli could be found on careful examination and other infective organisms were present. A tentative diagnosis of tuberculosis of the right kidney was therefore made and a nephrectomy advised and performed.

A large kidney distended with thin pus and with one or two cysts the size of a marble, similarly distended, was the result. Macroscopically no typical tubercular change was present and no bacilli could be found in the scrapings. Microscopically, however, several typical tubercles with giant cells, necrosis, epithelioid cells, and a surrounding zone of small round cells were found, and the clinical diagnosis was confirmed.

No interference with the quantity of urine passed occurred, the quantities for the days following operation being, 18, 17, 20, 14 ounces, practically the same as those immediately preceding, but the quantity rapidly increased to 41, 37, 39, 42 and 32 ounces per diem, a fact frequently seen and due in part to the fact that the absorption of toxic material from the diseased kidney interferes with the normal secretion of its fellow. The patient made an uninterrupted recovery. A cystoscopic examination previous to discharge from hospital showed no ulceration about the ureter and in December, 1906, one year later, the patient was still in good health and examination of the urine and bladder showed these perfectly normal.

Case III.—T., male, aged 30—Dr. F. G. Finley, October 28, 1905. This patient who was suffering from pulmonary tuberculosis, suddenly developed hæmaturia and an examination was undertaken to prove the nature of the lesion. Both ureters were catheterized and urine collected simultaneously as before. Without going into detail suffice it to say that the right urine was turbid containing a few pus cells and many blood casts; the left was also turbid with many pus cells and a few casts. No bacilli were found in the right but these were present in the left. A diagnosis of bilateral tubercular nephritis was made and no operation performed.

CASE IV.—R., male, aged 35—Dr. G. E. Armstrong, December 24, 1906. This case proved of more than usual interest. The patient had suffered for about six months from frequency and the occurrence of pus and blood in the urine according to his physician's statement. Tubercle bacilli had been reported in the urine but the seat of disease had not been determined and the patient was referred to hospital for further investigation.

The presence of bacilli was confirmed, also the presence of pus and microscopical quantities of blood. The bladder on examination was extremely sensitive, scarcely holding five ounces and one was not surprised on cystoscopic examination to find marked congestion of the surface with the presence of two or three tubercles the size of a pin's head about the trigone and an ulcer 5 mm. in diameter about the orifice of the left ureter. As not infrequently happens, however, in such cases it was extremely difficult to find the orifice of the ureters owing, as Caspar has shown, to the congestion and œdema present. In fact in many instances it is necessary to be guided by the stream of urine issuing from the ureter. After a somewhat prolonged search, however, the right ureter was found but so over-shadowed by the slightly enlarged prostate that its catheterization was impossible. The left ureter was catheterized, being found at the bottom of the ulcer aforementioned, and considerably displaced to the left, owing, as was subsequently proved to the thickened and contracted ureter. The urine from the right kidney was obtained by leaving a catheter in the bladder after thorough washing, while the ureteral catheter was in the left ureter. Compared the one with the other the urines were as follows:

Right: Acid, specific gravity 1025, yellow, mucoid sediment, urea 1.7 per cent., a trace of albumin, Ca. oxalate, a few pus cells, no bacilli.

Left: Neutral, specific gravity 1008, pale, flocculent sediment, urea .3 per cent., albumin present in considerable quantity, pus in quantity and tubercle bacilli.

The left kidney was evidently diseased and as it was doing but a tithe of the work of its fellow, removal was indicated. This was done and a large kidney with a slightly dilated pelvis, with a thickened fibrous ureter, with caseous material in calices extending up into pyramids and tubercles in all stages throughout cortex and medulla resulted. In other words a well advanced tuberculosis renis. The ureter was in part removed. The bladder was left to take care of itself as in these cases it seems well able to do.

The patient made an uneventful recovery, the quantity of urine per diem being unaltered and all symptoms improving. While it is too early at this date to form any opinion as to the ultimate outcome the prospects are of the brightest and at date of writing, October, 1907, the patient weighs 20 pounds more than at any previous time. The bladder condition is as yet stationary.

CASE V.—W. McK., male aged 22—Dr. G. E. Armstrong, February 9, 1907—complains of frequency for the past eight months. No history of pain, no hæmaturia, no loss of weight. Three weeks previous to observation swelling and tenderness of the left epididymis was observed (no venereal history); this has persisted. On examination the left seminal vesicle was found somewhat indurated, but not tender. The urine showed the presence of pus and tubercle bacilli. Cystoscopic examination revealed a normal urethra, a bladder capacity of 300 cc., the right urethral orifice normal, the left swollen and œdematous; one yellow spot was present just below the meatus and two were to be found in the left side of the bladder high up and several others about the trigone, which is slightly reddened. Pus is to be seen lying in base of bladder. The ureters were catheterized and the urine compared as follows:

	COMMON	RIGHT	LEFT
Reaction:	Acid	Acid	Alkaline
Color:	Pale	Clear	Turbid
Sediment:	Flocculent	Slight flocculent	Flocculent
Specific Gravity:	1015	1017	1013
Urea:	—	2.2 per cent.	1.3 per cent.
Δ:	—	—1.3	—.95
Microscopical:	Pus, tubercle bacilli	Epithelial cells no tubercle bacilli	Blood, pus and tubercle bacilli

From this a diagnosis of tuberculosis of the left kidney was readily made. At the same time the interference with the function of this organ as compared with the right was but slight and in consequence the probability was, that but a slight lesion was present. The truth of this interpretation was markedly demonstrated at operation. On removing the kidney nothing was evident on or beneath the capsule, nor indeed on first sectioning the organ, and it was only after opening up all the calices that one was found, where all the points of the pyramids projecting into it showed macro- and microscopically typical tubercle formation; in fact the point of greatest interest in this case lies in the fact that a lesion affecting so small a portion of kidney tissue could have produced so much interference with its function.

Case VI.—McD., male aged 40—Dr. E. M. von Eberts, February 23, 1907. This patient suffered severely from pain in the right side and back incapacitating him from work. Pus was present in the urine and a small hard mass was palpable in the right side of the abdomen. He had lost weight. In consequence he was referred for cystoscopic examination. The left ureter was easily found and catheterized, but the orifice of the right could not be found on two separate examinations, the reason therefor, as evidenced by subsequent events being a sclerosing ureteritis which almost obliterated the lumen of the ureter. Beyond an hypertrophy of the prostate nothing further abnormal was found in the bladder. The urine from the left kidney was obtained by catheter, that from the right by first washing the bladder and leaving a soft rubber catheter in it. The urine thus simultaneously obtained and a common specimen obtained by catheter from the bladder showed:

	Common	Right	Left
Color:	Turbid	Turbid	—
Specific Gravity:	1025	1010	1018
Reaction:	Acid	Acid	Acid
Albumin:	Present	Present	0
Microscopic:	Pus	Blood cells & pus, no tubercle bacilli	No pus

Evidently the right side was affected.

Taking cognizance of the fact that in tuberculosis the ureteral orifice of the affected side is often masked and displaced, a careful search was continued for tubercle bacilli and finally rewarded by finding these micro-organisms. A nephrectomy was undertaken and a small fibrosed kidney, with large caseous masses throughout, and microscopically typical tubercle formation, removed.

The point of interest here lies in the ureter, which was a thick (size of a 30 F. sound) fibrosed tube, extremely tense, and drawing the kidney down and right side of bladder up, thus accounting for displacement of the orifice, while the extremely small lumen accounted for the difficulty in locating it.

The patient made an uninterrupted recovery from the operation which apparently had no influence on the daily amount of urine excreted. What the ultimate outcome will be of a disease which had evidently been of long standing must be left to the future.

CASE VII.—P. N., male, aged 50—Dr. F. J. Shepherd, October 30, 1906. Two years previous to admission he had noticed blood in the urine. This had recurred on three subsequent occasions. He had also suffered from frequency and pain in the perineum which persisted up to the present. Examination of the urine showed the presence of pus and tubercle bacilli.

A cystoscopic examination was undertaken and the right ureteral orifice found normal. The left meatus was reddened and œdematous and a small slough and ulcer high up on the left side led one to make a diagnosis of tubercular cystitis. The fact, which has lately been emphasized by Walker of Johns Hopkins, that primary tuberculosis of the bladder is extremely rare had not as yet made sufficient impression on me. The right ureter was catheterized but owing to an accident to the other catheter we had to be content to take the left urine through the bladder after a preliminary washing. In comparison of the right, left and common specimens, the latter obtained by catheter immediately previous to examination, the following results were obtained:

	COMMON	RIGHT	LEFT
Color:	Turbid	Clear	Turbid
Specific Gravity:	1025	1027	1025
Albumin:	Present	—	—
Urea:	2.5	2.6	2.3
Microscopic:	Pus and blood, tubercle bacilli	No pus or blood or tubercle bacilli	Tubercle bacilli and blood

It was in consequence of the almost undisturbed function of the left side that a diagnosis of cystitis was adhered to in spite of the small ulcer and œdema near the left meatus, and the patient was handed over to Dr. von Eberts for observation on his opsonic index and tuberculin treatment.

Under this and hygienic treatment improvement was most marked, the patient gaining weight rapidly and losing his discomfort till in February, 1907, four months later no sign of the former ulcer was evident though some œdema remained and tubercle bacilli could still be found in the urine.

These observations leave no doubt in my own mind that here we had to deal not with a tuberculous cystitis, but with a tuberculous disease of the left kidney and secondary disease of the bladder. The patient continued to improve and hence the question of nephrectomy which would have settled all doubts has never been discussed. The case is of interest in showing the beneficial results of small doses of tuberculin in cases of genito-urinary tuberculosis.

CASE VIII.—Mrs. C., aged 24—Dr. E. M. von Eberts, February 18, 1907. Had been ill about one year with pain in the left loin and pyuria. She had lost some weight and a mass was present in the left side of the abdomen, which was most probably kidney. A cystoscopic examination was undertaken and the right meatus found normal. In place of the left was a large white slough the size of a large pea, which was displaced by the catheter and the mouth of the ureter disclosed. No definite tubercles were evident about this, but it was markedly reddened and slightly ulcerated. In addition a ridge was seen stretching from the left orifice towards the left and giving the appearance which a normal ureter gives when a rather stiff catheter is in place, suggesting that the ureter was under tension. The ureters were catheterized; the right flowed in normal spirts, the left slowly in drops and this was hastened by pressure on the abdominal mass. Examination of the urines showed:

	COMMON	RIGHT	LEFT
Reaction:	Acid	Acid	Acid
Color:	Turbid	Clear	Very turbid
Sediment:	Purulent sed.	No sediment	Purulent sed.
Specific Gravity:	1013	1022	1007
Urea:	1 per cent..	2 per cent.	0.5 per cent.
Albumin:	Trace	Trace	Present
Sugar (Phlorizin):	—	Present	0
Microscopical:	Pus, tubercle bacilli	No pus	Pus and blood, tubercle bacilli, diplobacilli

Consequently we made a diagnosis of tuberculosis of the left kidney and a sound organ on the right. A nephrectomy showed a large caseous kidney with practically no secreting tissue left and many adhesions about it, while the ureter was so tense as to seriously interfere with the removal of the organ. The patient made an uninterrupted recovery and is now apparently in the best of health.

CASE IX.—J. B., female aged 35—Dr. J. M. Elder, September 4, 1907—had not been well for 2 or 3 months but did not consult a physician till a week previous to admission to the hospital, when she experienced a severe attack of pain in the left side accompanied by a chill and sweating. The urine was subsequently dark colored. Five such attacks occurred, two while under observation in the hospital. They caused nausea but no vomiting and were aggravated by exertion. In short the history was that of a renal colic. A loss of weight of some 20 pounds had occurred inside the last year. Three sisters died of pulmonary tuberculosis. The urine contained pus; nothing could be made out on palpation of the abdomen.

A cystoscopic examination showed a normal bladder except for the fact that the right ureteral orifice was much reddened, œdematous and slightly depressed, and about this on close inspection were 2 or 3 tubercle-like spots with a greyish centre. Both ureters were catheterized and the urines examined and compared as follows: (Owing to some error the patient had been allowed to drink copiously before the examination, hence the low specific gravities present.)

	COMMON	RIGHT	LEFT
Reaction:	Acid	Acid	Acid
Specific Gravity:	1002	1007	1008
Sediment:	Slight flocculent sed.	Slight flocculent sed.	Clear
Albumin:	0	Present	Present
Urea:	—	1.2 per cent.	1.5 per cent.
Microscopical:	Pus	Pus	No pus, a few red blood cells

No tubercle bacilli could be found on repeated examination but in spite of this and founded largely on the appearance of the ureteral orifice a diagnosis of tuberculosis was made. A nephrectomy was undertaken and a kidney slightly enlarged with many adhesions about it was removed. About both poles a number of tubercles were to be seen and on section these were also found about the calices of both poles and in the pelvis where a deposit of lime salts had taken place. No doubt a fragment from these deposits had been responsible for the renal colic.

CASE X.—K., male, aged 25, stone-cutter—Drs. F. J. Shepherd and H. A. Lafleur, August 14, 1907. Three months previous to admission patient noticed some pain in the perineum and two weeks later some pain on micturition. This caused him to stop work and seek relief. A perineal abscess was opened and gradually healed. In August, 1907, he was admitted to the hospital for a febricula and on routine examination pus was discovered in his urine. Physical examination was negative.

A cystoscopic examination was made. The right ureteral orifice appeared normal. The left was swollen, reddened and œdematous so that the slightly turbid urine which could be seen issuing from it appeared to come from between small bullæ. Both ureters were catheterized with the following result:

	COMMON	RIGHT	LEFT
Color:	Turbid	Clear	Turbid
Reaction:	Acid	Acid	Alkaline
Albumin:	Present	0	Present
Urea:	2.3 per cent.	4 per cent.	½ per cent.
Δ	—	—2.68	—.5
Microscopical:	Pus	Occasional red blood cells, no pus	Pus and a few red blood cells

Repeated examination for tubercle bacilli resulted in showing the presence of 1 or 2 of these. Further evidence was furnished by inoculating a guinea pig which after 25 days showed typical lesions from which the bacilli were recovered.

The nephrectomy performed by Dr. J. F. Shepherd showed a very large kidney with small tubercles at both poles, the centre being free. On section the calices of upper pole were found to be badly ulcerated, the disease extending down on to the wall of the pelvis. The ureter was extremely thickened but did not appear tubercular microscopically.

CASE XI.—H., aged 21, male—Dr. G. E. Armstrong, September 14, 1907. Had had severe attacks of hæmaturia with slight pain in the left side of the abdomen in front and right side of back for about one year. Had not lost weight. Blood had occasionally been seen in very large quantities. The urine now contains pus. Examination was negative except that the lower pole of the right kidney was palpable.

Phlorizin was administered and a cystoscopic examination made and the ureters catheterized. The urethra and bladder including the ureteral orifices were normal. A comparison of the urines showed:

	COMMON	RIGHT	LEFT
Color:	Turbid	Turbid	Darker
Reaction:	Acid	Neutral	Alkaline
Specific gravity:	1016	1007	1025
Urea:	—	1.1 per cent.	3 per cent.
Albumin:	Present	Present	
Sugar:	—	Present	About twice quantity present in right
Δ	—	—.35	—1.3
Microscopical:	Pus and tubercle bacilli	Pus, tubercle bacilli	No pus, no tubercle bacilli

Consequently we concluded that the left side was sound, the right tubercular. Nephrectomy showed a condition not unlike that of Case V, viz.: nothing on the outside of the kidney, but one calix, where all the surrounding tissue was tubercular, the disease spreading into the surrounding tissue to a depth of $^3/_{10}$ to ¼ inch, the whole disease occupying about 9 cc. of kidney tissue. This is another example of the extent to which a slight lesion may influence the function of a kidney. In consequence of removing so much secreting tissue we were not surprised to note a decided diminution in the amount of urine secreted post operation. This, however, rapidly increased to normal.

To Summarize.—Case III is the only case in which symptoms or signs of any other focus of tuberculosis were to be found, if we exclude Cases I, V and VII where an epididymitis occurred some time subsequent to the primary renal symptoms, and Case X where a periurethral abscess was the first sign, though probably secondary to the kidney lesion. As

SYNOPSIS OF CASES.

Case.	Time Elapsed Since First Symptoms.	Earliest Symptoms.	Loss of Weight.	Hematuria.	Pyuria.	Frequency.	Dysuria.	Pain in Back.	Other Organs Affected.	Condition of Bladder.	Tubercle Bacilli.	Operation.	Pathological Report.	Remarks.
I.	3 years.	Hematuria.	+	+	+	..	..	+	Epididymis.	Ulcer about ureteral orifice.	Present.	Nephrectomy.	Macro- and microscopic, positive.	Died later of miliary Tuberculosis.
II.	6–8 weeks.	Pain in back. No urinary complaints.	+	..	+	..	..	+	None.	Ulcer about ureter.	Not found.	Nephrectomy.	Microscopic, positive.	Well 1 year post-operation.
III.	....	Hematuria.	+	+	..	..	..	..	Lungs.	Normal.	Present.	None.	....	Secondary to lung disease.
IV.	6 months.	Frequency.	+	+	+	+	+	+	None.	Ulcer about ureter.	Present.	Nephrectomy.	Macro- and microscopic, positive.	Has gained greatly in weight.
V.	8 months.	Frequency.	+	..	+	+	..	..	Epididymis.	Œdema about ureter. Tubercle.	Present.	Nephrectomy.	Early tuberculosis.	Has gained greatly in weight. Well.
VI.	....	Pain in back.	+	..	+	+	+	+	None.	Cystitis. Affected ureter not visible.	Present.	Nephrectomy.	Small fibrosed tubercular kidney.	Gained in weight; pain still present.
VII.	2 years.	Hematuria, pain, Frequency.	+	+	+	+	+	..	Epididymis.	Ulcer and œdema of bladder wall.	Present.	None.	....	Tuberculin injections.
VIII.	1 year.	Pain.	+	..	+	..	..	+	None.	Ulcer about ureter.	Present.	Nephrectomy.	Large caseous kidney.	Very marked improvement.
IX.	3 months.	Pain in side, renal colic.	+	+	+	..	..	+	None.	Œdema about ureter.	Not found.	Nephrectomy.	Early tuberculosis.	
X.	3 months.	Pain in perineum.	+	..	+	..	..	..	Periurethral abscess.	Œdema about ureter.	Found after inoculation.	Nephrectomy.	Positive.	
XI.	1 year.	Hematuria.	..	+	+	..	..	..	None.	Normal.	Present.	Nephrectomy.	Early tuberculosis.	

far as clinical evidence can be relied on this points to a primary renal tuberculosis. In 9 of the 11 cases tubercle bacilli were discovered in the urine, immediately in 8 and through inoculation in Case X. Two cases were not operated upon, all the remainder were verified micro- and macroscopically. Nephrectomy was the only operation performed.

Post Operation.—Case I in the course of some months developed a miliary tuberculosis and died; Case VI still complained of pain in the back, which possibly indicates some obscure bone focus, otherwise he gained greatly in weight. Case IX developed immediately after operation a pleurisy of the affected side, the nature of which is open to question.

Apart from the examination of the separated urines the cystoscopic examination showing the presence of ulceration, tubercles, or œdema about the ureteral orifices, rendered us valuable assistance.

These cases have so strengthened our belief in the usefulness and accuracy of the cystoscope and ureteral catheter, viewed from a diagnostic standpoint, that we feel justified in going a step further and taking a more hopeful view of this malady. If we can make an early diagnosis of tuberculosis of the kidney and if this may be a unilateral primary disease, as seems often to be the case, then our prognosis should be better than it has been in the past. In the present instance we have purposely refrained from drawing conclusions as to the ultimate prognosis, as some of the cases are still under observation, and we feel that only observation over an extended period can justify such conclusions.

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